3GPP TSG-RAN WG2 #109bis-e R2-20xxxxx

Electronic Meeting, April 20th – 30th 2020

Agenda Item: 5.4.1.1

Source: Ericsson

Title: Summary from [AT109bis-e][001][NR15] PDCP version change (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document is to kick off the following email discussion:

* [AT109bis-e][001][NR15] PDCP version change (Ericsson)

Part 1: first rounds of comments, suggest decisions based on initial comments, identify whether there is need for on-line treatment. Deadline: April 23, 0700 UTC

Part 2: if agreeable, expected continuation to agree CRs.

The following three sets of papers relate to this topic:

**Set 1**

[R2-2003685](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003685.zip) Clarification on PDCP version change Huawei, HiSilicon

[R2-2003686](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003686.zip) Clarification on PDCP version change Huawei, HiSilicon

[R2-2003687](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003687.zip) Clarification on PDCP version change Huawei, HiSilicon

[R2-2003688](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003688.zip) Clarification on PDCP version change Huawei, HiSilicon

**Set 2**

[R2-2003399](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003399.zip) PDCP version change with or without handover Ericsson, Intel Corporation

[R2-2003400](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003400.zip) Allowing PDCP version change without handover Ericsson, Intel Corporation

[R2-2003401](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003401.zip) Allowing PDCP version change without handover Ericsson, Intel Corporation

[R2-2003402](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003402.zip) Allowing PDCP version change without handover Ericsson, Intel Corporation

[R2-2003405](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003405.zip) Allowing PDCP version change without handover Ericsson, Intel Corporation

**Set 3**

[R2-2002987](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2002987.zip) TS 36.331 Clarifying the options for PDCP version change Nokia, Nokia Shanghai Bell

[R2-2002988](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2002988.zip) TS 37.340 Clarifying the options for PDCP version change Nokia, Nokia Shanghai Bell

# 2 Background

The issue of PDCP version change between LTE and NR PDCP has been discussed in the past few RAN2 meetings. Due to an ambiguity in the specifications, companies had different understandings of whether PDCP version could be changed with or without handover.

When this ambiguity was discovered companies originally proposed CRs to:

1. Force all UEs to support PDCP version change without handover

2. Forbid PDCP version change without handover

The proponents of 1 assumed that the specification already allowed PDCP version change without handover, hence arguing that the ambiguity in the specification shall be resolved by making it clear that PDCP version change without handover is allowed.

Other companies argued that 1 would not be backwards compatible as there may be UEs in the field which assumes that PDCP version change is never be performed without a handover or fullConfig. Hence these companies proposed CRs forbidding this, i.e. 2.

# 3 Discussion

## 3.1 Part 1

Based on the interpretation of the rapporteur of this email discussion there seem like no company proposing option 1 any longer. Instead we have these two options on the table in this meeting:

2. Forbid PDCP version change without handover

3. Add a UE capability bit indicating if PDCP version change without handover is supported

3\* Add a UE capability bit indicating if PDCP version change without handover is supported, but do the change in Rel-16 with a magic sentence.

First, it is suggested that companies agree on which proposals are still open for discussion to ensure that there is no fourth solution which has been missed.

**Q1: Do you agree that only option 2 and 3 above are on the table? If "no", please elaborate in the comment-field.**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| Nokia | No, we found already some proof in the specifications why version change with and without HO are already supported in today’s specification. | PDCP version change via Case 1) in our paper “RRCConnectionReconfiguration including DRB release and add and NOT including mobilityControlInfo)” should anyway be allowed in following cases:  **Scenario 1:** TS37.340 8.3 “One step (direct) bearer type change with PDCP version change (only applicable for EN-DC) is supported.” --> This already is possible without HO   * We think it’s true at least in case of associated bearer PDCP termination point change (i.e. with different Security Key to avoid security issue)   **Scenario 2** TS37.340 4.2.1 “for the initial change of SRB1 from E-UTRA PDCP to NR PDCP, with a reconfiguration without mobility before the initial security activation”   * HO is neither possible nor necessary since security is not yet activated (i.e. no security issue at this time point).   **Scenario 3:** PDCP version change w/ different DRB ID w/ HO or full config  NOTE (about security key issue): 3gpp mandates {DRB ID, Security Key, PDCP SN } shall not be repeated for UL/DL data transmission. See TS36.331 5.3.1.2 “The eNB is responsible for avoiding reuse of the COUNT with the same RB identity and with the same KeNB, e.g. due to …, release and establishment of new RBs, …”  i.e. it implies technically,  o PDCP version change with same DRB ID w/o HO or fullConfig is already possible, if it’s associated with bearer termination point change (i.e. security key change); e.g. change from MN terminated MCG LTE PDCP to SN terminated split NR PDCP.  o PDCP version change with same DRB ID w/o HO or fulfConfig is NOT possible, if associated bearer termination point is unchanged (i.e. w/o security key change). e.g. change from MN terminated MCG LTE PDCP to MN terminated MCG NR PDCP. |
| Qualcomm Incorporated | Yes | Given the positions expressed by companies, we think those options are possible ways out.  In our view, it is not worthwhile at this stage to discuss what is clear or unclear in the current standard. |
| vivo | Yes |  |
| OPPO | Yes |  |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| NTT DOCOMO | Yes | Agree witn Qualcomm |
| Intel | Yes | Given the current situation in the field, we have to try to find a solution that is reasonable for the implementations. |
| Samsung | Depending on which option 3 we are talking about | We are pretty sure that allowing both options are intended behavior (see R2-1808949) but we acknowledge different views from different companies also exist. Let’s not discuss it further.  However it would be worthwhile sharing current situation observed in the field.  So far, all 5G networks in Korea are using release/add for PDCP version change and not a single IOT problem has been reported. We expect the similar situation in US as well.  What above means is almost all UEs in the field also support PDCP version change without HO.  When a specification is arguably broken and to be fixed, we need to protect the already deployed network and UE in the field.  For the sake of cooperation at good will, we are open to discuss option 3 but above situation shall be taken into account. |

The proponents of option 3 suggests that there is a benefit of allowing PDCP version change without handover as a handover can be avoided and hence unnecessary interruption and signalling can be avoided. It would however require that RAN2 introduces a bit in UE capability signalling.

**Q2: Which of option 2 and 3 should be adopted? Please provide reasoning in the comment-field.**

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| Company | 2 or 3 | Comments |
| Ericsson | 3 but 3\* would also be an acceptable comromize for us. | We think small cost of a capability bit is justified considering that handovers can be avoided hence avoiding interruptions and unnecssary random access-procedures can be avoided.  **Further input 2020-04-22 18:55 CET**:  A potential further compromize would be that we implement the CR for 3 but for Rel-16 with a magic sentence and hence leaving Rel-15 untouched. This would be acceptable to us if it would help progressing this topic. |
| Nokia | Neither of the options | As discussed above there are already scenarios today where the specification supports PDCP version change with/without HO with DRB rel/add. |
| Qualcomm Incorporated | 3 | This looks like a good compromise. |
| vivo | 3 | Current specification may support PDCP version change, but it is may not ne straightforward. Further we think this may be related to the UE capability. |
| OPPO | 3 | Same view as QC, it seems to be a compromise way. |
| Huawei | Either of the option | We slightly prefer option 2, but if majority of companies is fine with option 3, we can also accept option 3. |
| MediaTek | 3 | Our original view is option 2 but we are OK with option 3.  This is a function that is unclear whether it should be supported by the UE according to latest SPEC. Thus, we think the general practice is to add a capability bit for it to avoid IOT issue. So, option 3 would be a good way forward. |
| NTT DOCOMO | 3 | Agree that Option 3 is a good compromise. |
| Intel | 3 or 3\* | With different implementations in the field, the only clean way to solve this is to introduce a capability bit. |
| Samsung | 3\* | We are not able to agree on Release 15 change. The last line for us is 3\* |

Companies are invited to provide any other input they might have on this issue.

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| Company | Comments |
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### 3.1.1 Summary Part 1:

Based on input above, the following seems agreeable:

1. RAN2 adds a new capability bit indicating if the UE supports PDCP version change without handover. From which release is TBD.

## 3.2 Part 2

If the above is agreeable, RAN2 should add a UE capability bit indicating whether the UE supports PDCP version change without handover. It is still open from which release this change should be made and whether there should be a magic sentence for this CR.

**Q3: From which release should the change be made?**

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| --- | --- | --- |
| Company | Rel-15 or Rel-16 | Comments |
| Ericsson | Rel-16 | As a compromize we believe that the change could be made from Rel-16 and a magic sentence should be added. |
| NTT DOCOMO | Rel-16 | Given the late stage for Rel-15, the proposed change should be applied from Rel-16. A magic sentence could be a nice compromise amongst interested companies. |
| Intel | Rel-16 | Any solution we adopt in standards for Rel-15 does not help with existing implementations. Work around will need to be found in the field on how to interwork between products that are not fully compatible.  In that regard, a clean solution of introducing the capability bit for Rel-16 can be seen as a compromise. |
| Samsung | Rel-16 | As indicated in 3.1 and also aligned with Intel argument, we think any solution in Rel-15 does not help and will not be acceptable for some implementations. |
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**Q4: Should there be a magic sentence on the CR?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| Ericsson | Yes |  |
| NTT DOCOMO | Yes |  |
| Intel | Yes | It allows early implementation of the feature and not having to implement the rest of Rel-16 mandatory features. |
| Samsung | Need further discussion | In the current proposed CR where a bit indicating the support of PDCP version change without HO is either absent or present, there is no way for network to distinguish already deployed UEs supporting both options and UEs only supporting version change with HO and not reporting the capability. Then implementing the signaling by Release 15 UE may not be useful at all.  To address above concern, we may consider different signaling (e.g. capability bit mandatory present with BOOLEAN value), which need further discussion.  All in all, we should first decide the signaling detail and then decide to include magic sentence if it helps. |
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### 3.1.1 Summary Part 2:

TBD

# 4 Conclusion

The following seems agreeable:

RAN2 adds a new capability bit indicating if the UE supports PDCP version change without handover.

# 5 References